

Module #6 Cold Mass Assembly Outside of the Clean Room

Tug Arkan, Don Mitchell

Week-III

Day 8 – May 29, 2006

Technicians removed all of the cavity support posts and related hardware from the rail after the cavity string was attached to the cold mass support on Day 7.

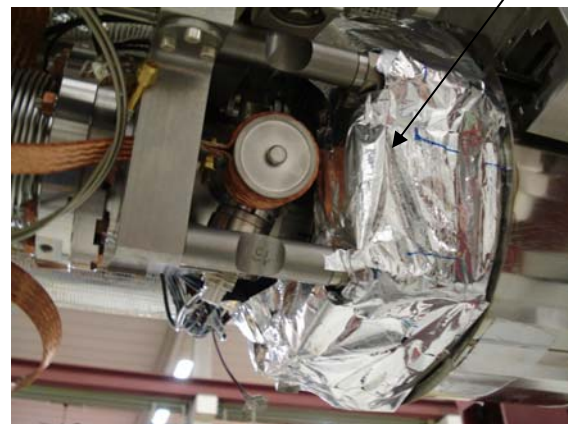
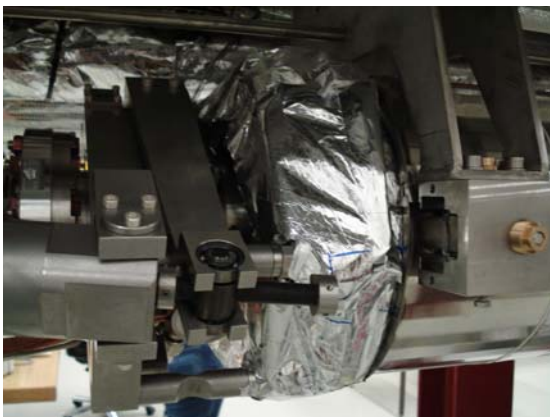


They tucked in and taped insulation layers on the cavity tuner end.



Before the
insulation was
tucked in

After the
insulation was
tucked in and
taped



DESY laser survey crew arrived and started to setup their laser tracker equipment. They inserted Taylor-Hobson alignment references in the 3 cold mass support posts. They used standard optical scopes to align the Cold Mass only. They adjusted the nuts on the cold mass support posts until the supports were leveled with each other and without twist. This “tweaking” caused the cavity string to move slightly. During future alignment, the cavities will be re-aligned. The cold mass was aligned to ± 0.3 mm with the optical scopes.



Day 9 – May 30, 2006

Survey crew continued to set up and calibrate the laser tracker system. They have previously placed fiducial mounts in many locations (floor, walls) in Hall 3 near the cold mass assembly area. Approx. 20 locations on the floor and about 6 locations on the walls were used.



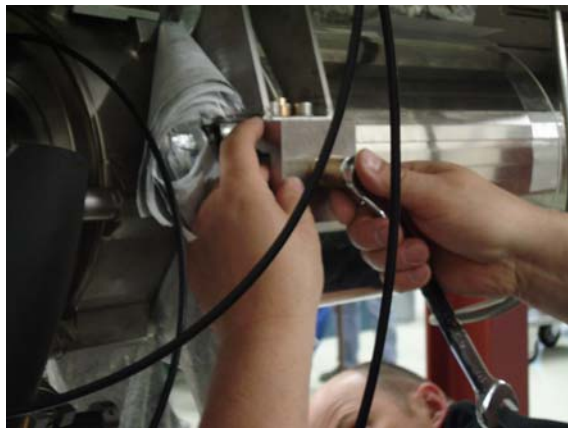
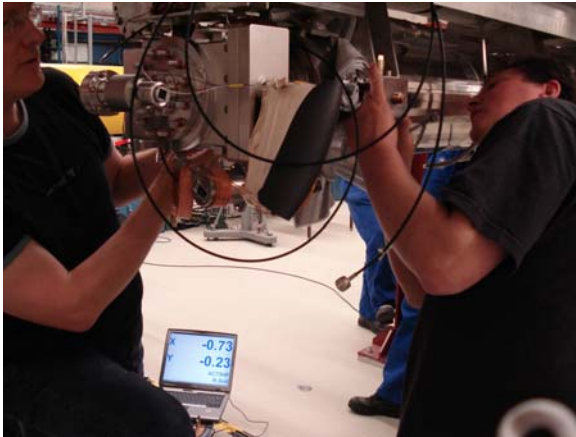
They glued onto the magnetic shield, 2 fiducials per cavity. These 2 points were used as transfer points from the cavity alignment flanges / rings. Direct, line of sight to the alignment flanges / rings is impossible, so the flange / ring locations were read around the perimeter of the ring using a stick probe laser reflector and translated to the magnetic shield fiducials.

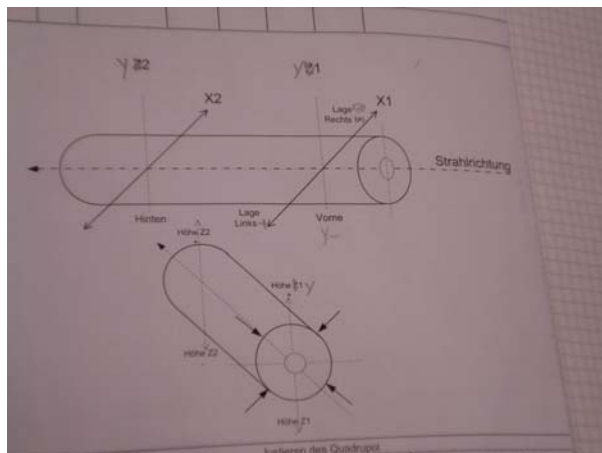


This was the first time that DESY used a laser tracker system to align the cavity string to the cold mass support. Calibration and verification took all of day 9. They worked on Cavity #1 alignment all day to ensure that the alignment technique and laser tracker system was working properly.



The alignment was done by loosening the brass screws on the cavity support lug needle bearing blocks and turning the adjustment screws until the X-Y displacements were within the acceptable range (± 0.1 mm). This adjustment was real-time and they were reading the displacements from a laptop while turning the screws on the needle bearing block.





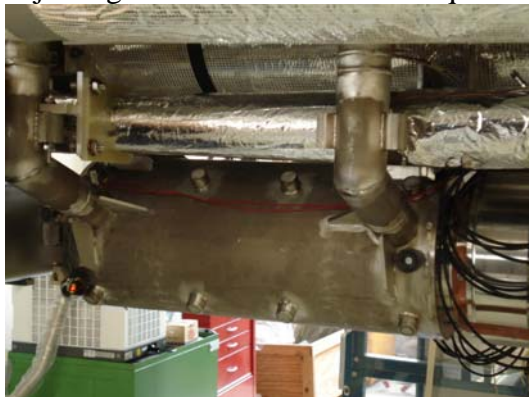
Day 10 – May 31, 2006

Survey crew aligned the remaining cavities with the laser tracker. Technicians turned the brass screws on the needle bearing supports until the read-outs of the laptop screen showed they were within the required tolerance of $\pm 0.1\text{mm}$.

This work took all day. No other components were attached to the cold mass during the survey procedures. All crane activity at Hall 3 was suspended to reduce vibrations in the building.



They also aligned the BPM/Quadrupole package. Module #6 does not have needle bearing supports for the Quadrupole support to the cold mass. So the alignment was done by adjusting the screws that hold the quadrupole to the cold mass.





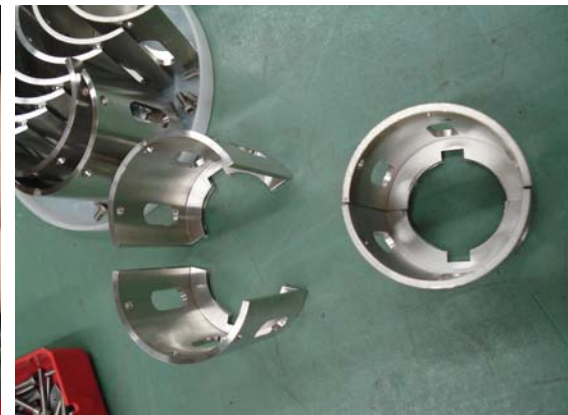
Survey group worked late until 9.00pm on Day 10 to finish the alignment of all the 8 cavities and the quadrupole magnet.

Day 11 – June 01, 2006

Technicians mounted the heat shields (cones) on the cavities main coupler flange.

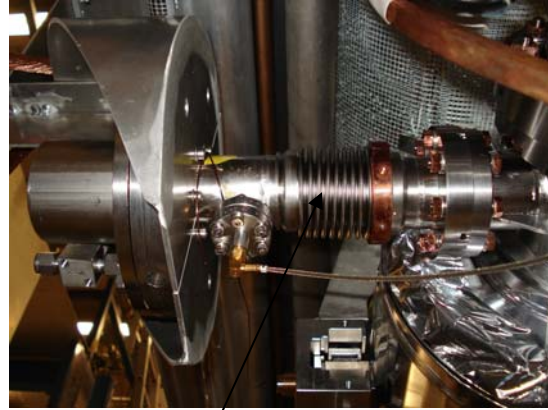


The main coupler bellows squirm protection hardware was removed.





Squirm protection hardware



Squirm protection hardware removed

Heat sink collars were installed onto the main coupler after the bellows squirm protection hardware was removed. The collars have 2 copper cables that connect onto the 4K shield on the cold mass.

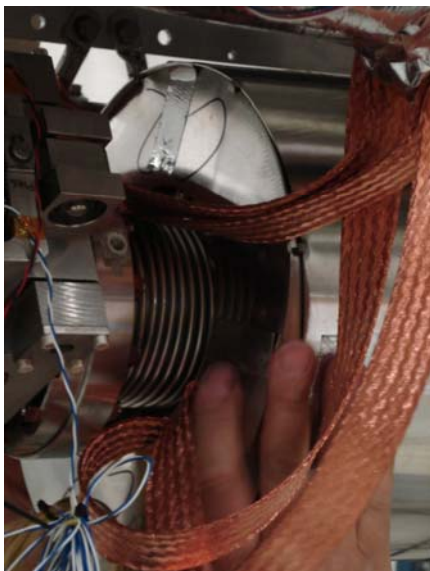
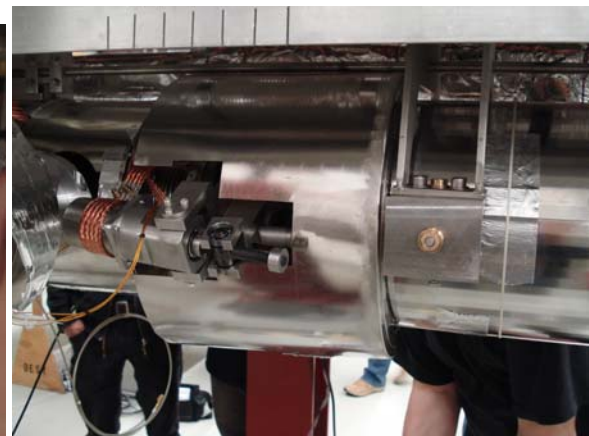
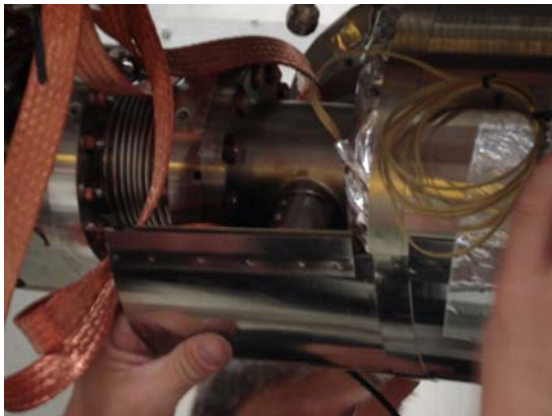




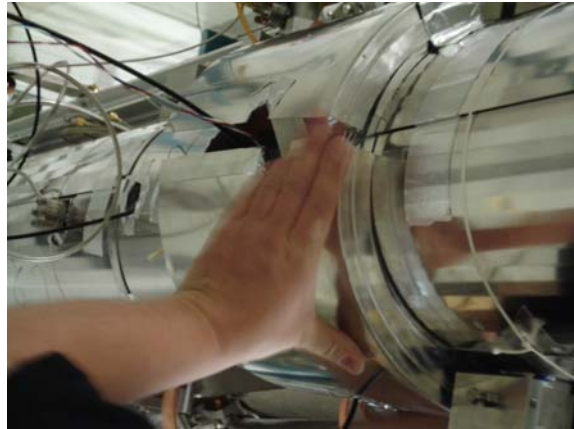
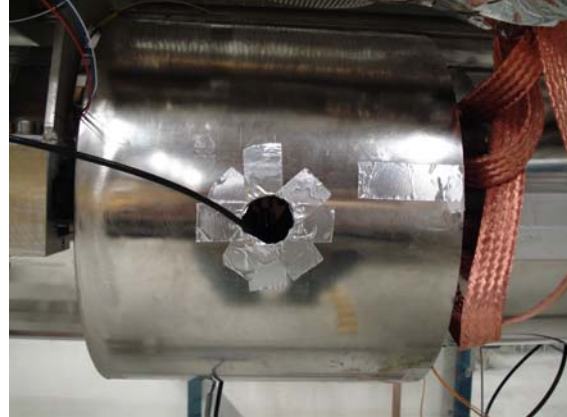
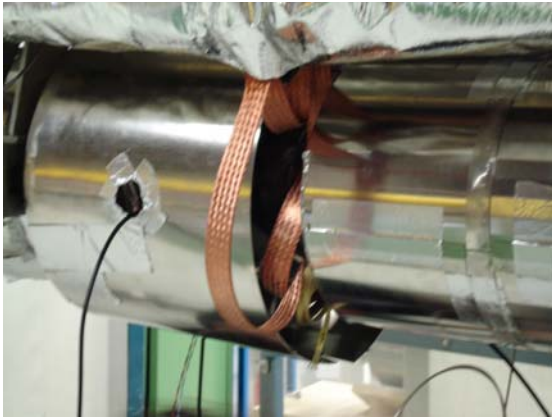
The cones were wrapped with 5 layers of insulation. These cone shields have 2 copper cables that connect to the 80K heat shield of the cold mass.



Technicians installed magnetic shield on the end of the cavities.



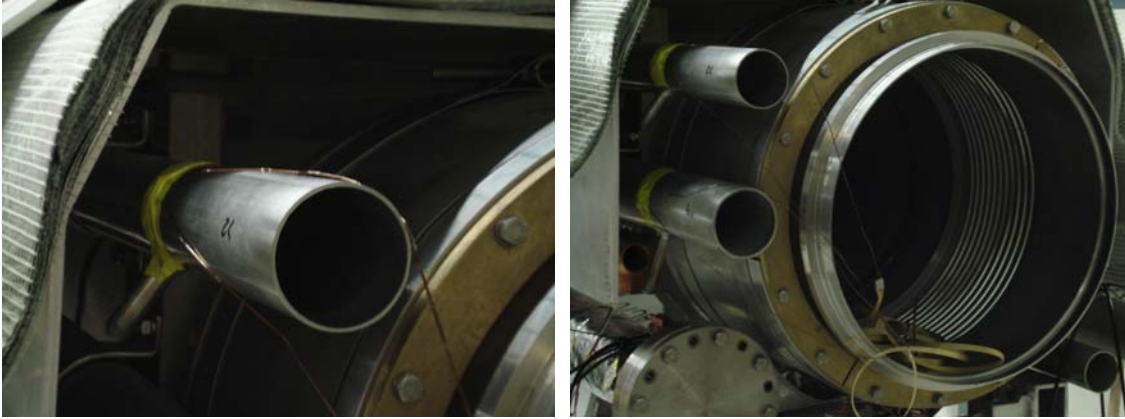
Read-out cables were routed through the cutouts on the magnetic shields. Aluminum tape was used to eliminate sharp edges on the cutout of the shields.



Some shields were not fitting well, so the double layer joints were pried open slightly to allow the shielding to interlock.

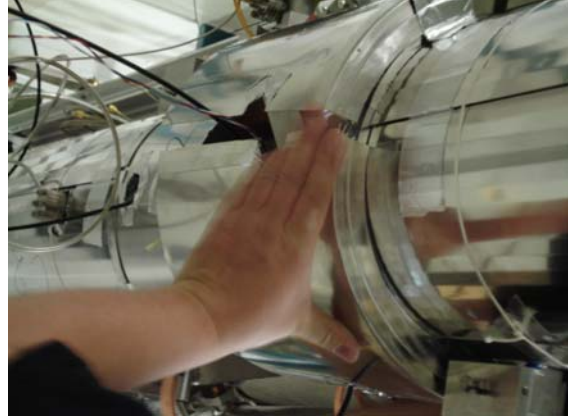


A technician installed thermo-couples on the cryogenic supply pipes of the cold mass. He used a black epoxy glue to glue the thermo-couples around the pipes.

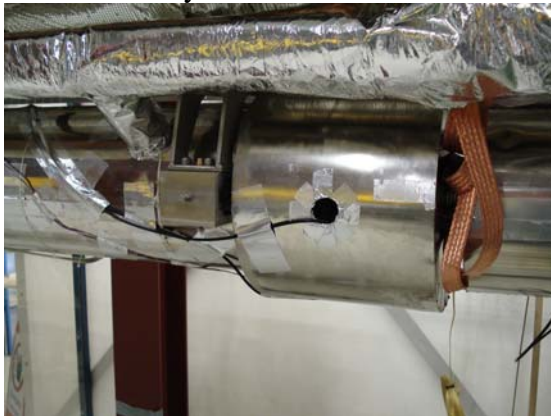


Day 12 – June 02, 2006

Technicians installed the remaining magnetic shields on the cavity ends. Most shields were difficult to fit. Technicians had to use a hammer and pliers to try to fit some shields.



Technicians routed all of the cables & wires and used aluminum tape to hold the cables in place around the magnetic shields. The wires were wrapped in a spiral pattern around the magnetic shield. Finally, the wires and cables were coiled into a circular bundle and placed around the end of the main coupler of each cavity. The wires and cables were left there so that they will be accessible once the cold mass is inserted into the vacuum vessel.

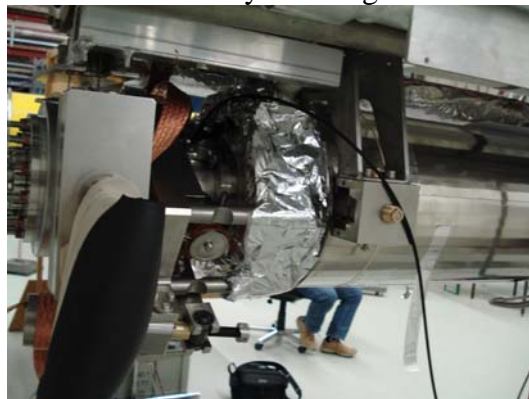




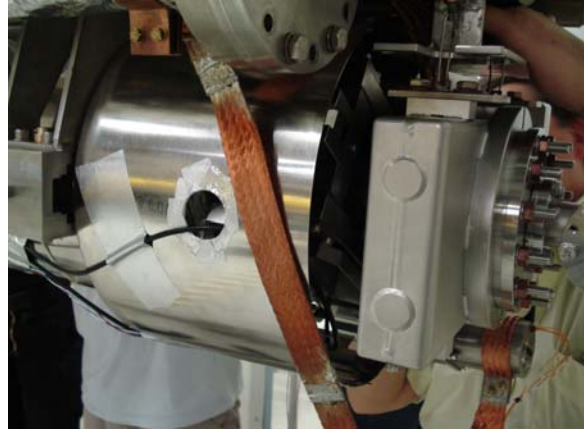
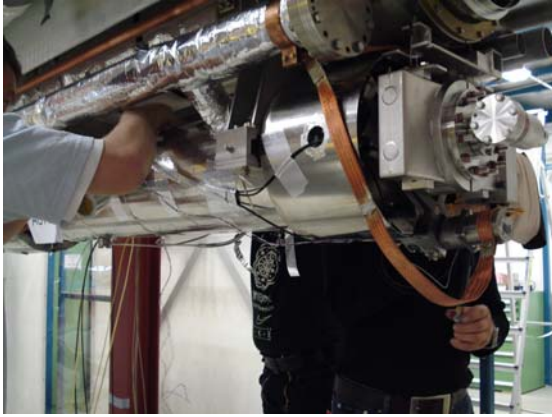
2 technicians ran tests at each tuner motor to insure that the motors are running properly.



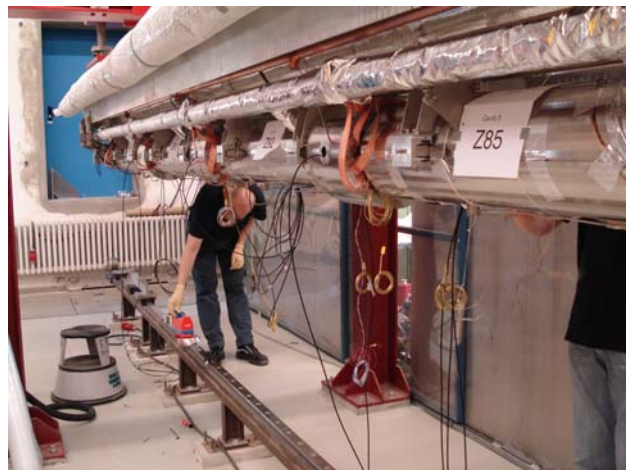
Cavity #1's insulation was trimmed and taped between the cavity #1 and gate valve.



Technicians installed magnetic shields on Cavity #1 end between Cavity#1 and the gate valve. It was again difficult to fit the shields together. Technicians had to pry the interconnecting edges and they needed to modify some face piece shields around the gate valve and tuner motor. Some shield components were even cut into several pieces to help with the installation.



Technicians completed the magnetic shields installation and checked all the shielding around the cavity string. They made sure that all the cables and wires were taped properly to the shields.



By the end of Day 12, the cold Mass was finally ready to be moved to the Big Bertha Fixture for the remainder of the assembly.

